

What is claimed is:

### CLAIMS

1. A method for decoding a noisy signal provided from the coordinates of a point in a point constellation, each constellation point being associated with a digital data item of a determined number of bits, comprising the steps of:

determining, based on the noisy signal, components of a received point;

5 determining a reference point associated with a digital reference data item and corresponding to the constellation point closest to the received point;

determining at least one concurrent point corresponding to the constellation point closest to the reference point associated with a digital data item, having a bit of determined rank with a logic value opposite to the bit of determined rank of the reference data; and

10 determining, at least for the bit of the reference digital data at said determined rank, a precision data item based on the received point, the reference point, and the concurrent point,

15 wherein the determination of the bits of the digital data associated with the concurrent point is performed based on the values of some of the bits of the reference digital data and on said rank.

2. The method of claim 1, wherein the constellation points for which the bits of the digital data associated with the determined rank have a determined logic value are distributed in at least one set of juxtaposed points symmetrical with respect to the axis or the other one of two reference axes (X, Y) of the constellation.

20 3. The method of claim 1, wherein for successive ranks, the constellation points for which the bits of the digital data associated with said successive ranks have a determined logic value are distributed in at least one set of juxtaposed points symmetrical with respect to a same reference axis (X, Y) of the constellation.

25 4. The method of claim 1, wherein the constellation is a Gray constellation.

5. The method of claim 1, wherein the constellation is a quasi-Gray constellation.

6. The method of claim 1, wherein the noisy signal is provided by a quadrature amplitude modulation.

7. A decoding device comprising:

5 a means for receiving a noisy signal provided from the coordinates of a point of a point constellation, each point in the constellation being associated with a digital data item of a determined number of bits;

a means for determining based on the noisy signal components of a received point;

10 a means for determining a reference point associated with a reference digital data item and corresponding to the constellation point closest to the received point;

a means for determining at least one concurrent point corresponding to the constellation point closest to the reference point associated with a digital data item, having a bit at a determined rank with a logic value opposite to the bit at the same determined rank of the reference data; and

15 a means for determining, at least for the bit of the reference digital data at the determined rank, a precision data item based on the received point, on the reference point, and on the concurrent point

20 wherein the means for determining the at least one concurrent point comprises a means for determining bits of the digital data associated with the concurrent point based on the values of some of the bits of the reference digital data and on the determined rank.

8. A method for decoding a received point to a corresponding point in a point constellation, the received point and each point in the constellation having a number of bits, the method comprising:

25 determining a reference point corresponding to the point in the constellation that is nearest the received point;

30 determining at least one concurrent point corresponding to the constellation point nearest the reference point having a selected bit that is the complement of the corresponding bit of the reference point, with the bits of the concurrent point being determined as a function of the bits in the reference point and a rank associated with the selected bit; and

determining a decoded point corresponding to the decoded received point, the decoded point ~~being~~ point being determined as a function of received point, the reference point, and the concurrent point.

5        9.        The method of claim 8 wherein the point constellation comprises a Gray or quasi-Gray constellation.

10.       The method of claim 8 wherein the received point corresponds to a point derived from a received quadrature amplitude modulated signal.

10       11.       A method for determining a concurrent point in a modulation technique including a point constellation, the method comprising:  
determining a reference point; and  
determining at least one concurrent point without performing any distance calculations.

15       12.       The method of claim 11 wherein determining at least one concurrent point without performing any distance calculations comprises determining at least one concurrent point corresponding to a point in the constellation that is nearest the reference point and that has a selected bit that is the complement of the corresponding bit of the reference point, with the bits of the concurrent point being determined as a function of the bits in the reference point and a position of the selected bit.

20       13.       The method of claim 11 wherein the point constellation comprises a Gray or quasi-Gray constellation.

14.       The method of claim 11 wherein the modulation technique comprises quadrature amplitude modulation.

25       15.       A decoding device, comprising:  
a receiver adapted to receive a modulated signal and operable to generate a received data word from the modulated signal, the received data word having a number of bits;

a reference data word generator coupled to the receiver and operable to generate a reference data word derived from the received data word and a point constellation;;

a concurrent data word generator coupled to the reference data word generator and operable to generate at least one concurrent data word point as a function of the bits in the reference data word and a position of a selected bit in the reference data word; and

5 a decoded word generator coupled to the receiver, reference data word generator, and concurrent data word generator, the decoded word generator operable to generate a decoded word as a function of received data word, the reference data word, and the concurrent data word.

16. The decoding device of claim 15 wherein the decoding device is formed within an integrated circuit.

10 17. The decoding device of claim 16 wherein the integrated circuit comprises a modem.

18. An electronic system, comprising:

a decoding device including,

15 a receiver adapted to receive a modulated signal and operable to generate a received data word from the modulated signal, the received data word having a number of bits;

a reference data word generator coupled to the receiver and operable to generate a reference data word derived from the received data word and a point constellation;;

20 a concurrent data word generator coupled to the reference data word generator and operable to generate at least one concurrent data word point as a function of the bits in the reference data word and a position of a selected bit in the reference data word; and

25 a decoded word generator coupled to the receiver, reference data word generator, and concurrent data word generator, the decoded word generator operable to generate a decoded word as a function of received data word, the reference data word, and the concurrent data word.

19. The electronic system of claim 18 wherein the electronic system comprises a computer system.

30 20. The electronic system of claim 19 wherein the decoding device is formed within an integrated circuit.